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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,699	01/19/2004	Jeffrey M. Hoffman	OPTRES.026C2	8455

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EXAMINER

HASAN, MOHAMMED A

ART UNIT PAPER NUMBER

2873

DATE MAILED: 06/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/759,699

Applicant(s)

HOFFMAN ET AL.

Examiner

Mohammed Hasan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 82 - 109 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 89 - 91, 93 - 101 is/are allowed.
- 6) ☒ Claim(s) 82 - 88, 92, 102 - 109 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3/25/04
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: ____

DETAILED ACTION

Oath/Declaration

1. Oath and declaration filed on 1/19/2004 is accepted.

Information Disclosure Statement

2. The prior art documents submitted by applicant in the Information Disclosure Statement filed on 3/25/2004 have all been considered and made of record (note the attached copy of form PTO – 1449).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 82 – 88, 92, and 102 - 109 are rejected under 35 U.S.C 103(a) as being unpatentable over Owa et al (US 2003/0025894 A1) in view of Takaoka (6,137,626).

Regarding claim 82, Owa et al discloses (refer to figures 1 and 2) a photolithography tool (30) comprising: a light source outputting light for illuminating a

reticle (31), condenser optics positioned to receive light from light source (both included in illumination apparatus, paragraph 0038), condenser optics positioned to direct an optical beam formed from light through reticle and projection optics configured to form an image of reticle onto a substrate (wafer 42), projection optics configured to form an image of reticle onto a substrate projection optics having an exit pupil, projection optics including: a first cubic crystalline (e.g., lens element 34 – 39) optical element aligned along an optical axis first cubic crystalline optical element having intrinsic birefringence that contributes to retardance in exit pupil, intrinsic birefringence of first optical element having increased magnitude at a first set of lobes at a first set arranged in an azimuthal direction about optical axis, a second cubic crystalline optical element aligned along optical axis, second cubic crystalline (e.g., lens element 34 – 39) optical element having intrinsic birefringence of second optical element having increased magnitude at a second set of lobes at a second set of locations arranged in an azimuthal direction about optical axis, a third cubic crystalline (e.g., lens element 34 – 39) optical element aligned along optical axis, third cubic crystalline (e.g., lens element 34 – 39) optical element having intrinsic birefringence that contributes to retardance in exit pupil, intrinsic birefringence of third optical element having increased magnitude at a third set of lobes at a third set of locations arranged in an azimuthal direction about optical axis (paragraph 0037 – 0046). Owe et al discloses all of the claimed limitations except where the first, second and third cubic crystalline optical elements have a common lattice direction aligned parallel to an optical axis and first, second and third cubic crystalline optical elements have their respective crystal lattice selectively azimuthally

rotated with respect to each other to reduce retardance over a substantial portion of exit pupil, first set of lobes being azimuthally rotated with respect second set of lobes and second set of lobes such that first set of lobes , second set of lobes , and third set of lobes are oriented differently with respect to each other. However, Takaoka teaches that in order to compensate for retardation within an optical system with high accuracy (column 1, lines 6 – 12), it was well known in the art to rotate the polarization of light passing through the optical system in between the first and second group of optical refracting elements, in order to bring the net retardance of the system to zero (column 3, lines 52 – 65). Therefore, it would have been obvious to in first, second and third optical elements have a common lattice direction aligned parallel to an optical axis and first, second, third cubic crystalline optical elements have their respective crystal lattices selectively rotated with respect to each other to reduce retardance and first , second , third set of lobes are oriented differently with respect to each other , in order to bring net system zero .

Regarding claim 83, Owa et al discloses, wherein first, second and third cubic crystalline optical elements comprise calcium fluoride (paragraph 0042).

Regarding claim 84, Owa et al discloses, wherein first, second and third cubic crystalline optical elements are selectively azimuthally rotated such that second set of lobes is positioned about optical axis at locations azimuthally offset from midway between the first set of locations of first set azimuthally offset from the midway between the second set of locations of second set of lobes (paragraph 0052).

Regarding claim 85, Owa et al discloses, a fourth cubic crystalline optical element aligned along an optical axis, fourth cubic crystalline optical element having intrinsic birefringence of fourth optical element having increased magnitude at a fourth set of lobes at a fourth set of locations arranged in an azimuthal direction about an optical axis, wherein fourth cubic crystalline optical element has a crystal lattice selectively azimuthally rotated with respect to the crystal lattices of each of the first, second, and third cubic crystalline optical elements to reduce retardance over a substantial portion of exit pupil, fourth set of lobes being selectively azimuthally rotated with respect to third set of lobes such that fourth set of lobes are oriented differently with respect to first, second and third set of lobes (paragraph 0062).

Regarding claim 86, Owa et al discloses, wherein light source comprises a 248 nanometer light source outputting light having of 248 nanometers for illuminating reticle 31 and projection optics is substantially optically transmissive to light having a wavelength of 248 nanometers (paragraph 0092).

Regarding claim 87, Owa et al discloses, wherein light source comprises a 193 nanometer light source outputting light having of 193 nanometers for illuminating reticle 31 and projection optics is substantially optically transmissive to light having a wavelength of 248 nanometers (paragraph 0092).

Regarding claim 88, Owa et al discloses, wherein light source comprises a 157 nanometer light source outputting light having of 157 nanometers for illuminating reticle 31 and projection optics is substantially optically transmissive to light having a wavelength of 248 nanometers (paragraph 0092).

Regarding claim 92, Owa et al discloses (refer to figures 1 and 2) a method of fabricating an optical system (30) having an exit pupil method comprising disposing a first cubic crystalline optical element along an optical axis, first cubic crystalline optical element having intrinsic birefringence that contributes to retardance in an exit pupil, disposing a second cubic crystalline optical element along an optical axis, second cubic crystalline optical element having intrinsic birefringence that contributes to retardance in exit pupil (paragraph 0037 – 0046). Owa et al discloses all of the claim limitations except first and second cubic crystalline optical elements having respectively crystal lattices selectively azimuthally rotated about the optical axis such that a substantial portion of retardance contributed by first cubic crystalline optical orthogonal to substantial portion of retardance contributed by second cubic crystalline optical element so as to substantially cancel and reduce the retardance within the optical system. However, Takaoka teaches that in order to compensate for retardation within an optical system with high accuracy (column 1, lines 6 – 12), it was well known in the art to rotate the polarization of light passing through the optical system in between the first and second group of optical refracting elements, in order to bring the net retardance of the system to zero (column 3, lines 52 – 65). Therefore, it would have been obvious to cubic crystalline optical elements having respectively crystal lattices selectively azimuthally rotated about the optical axis such that a substantial portion of retardance contributed by first cubic crystalline optical orthogonal to substantial portion of retardance contributed by second cubic crystalline optical element so as to substantially cancel and reduce the retardance, in order to bring net system zero.

Regarding claim 102, Owa et al discloses (refer to figure 2) a cubic crystalline optical system comprising at least two different cubic crystalline optical elements (plurality of lens elements 34 – 39) each having a different lattice direction aligned along a common optical axis and two cubic crystalline optical elements (paragraph 0060). Owe et al discloses all of the claimed limitations except crystal lattices selectively rotated with respect to each other and about the optical axis to reduce retardance within the optical system. However, Takaoka teaches that in order to compensate for retardation within an optical system with high accuracy (column 1, lines 6 – 12), it was well known in the art to rotate the polarization of light passing through the optical system in between the first and second group of optical refracting elements, in order to bring the net retardance of the system to zero (column 3, lines 52 – 65). Therefore, it would have been obvious to cubic crystalline optical elements having respectively crystal lattices selectively rotated about the optical axis to reduce retardance within the optical system for the purpose of bring net system zero.

Regarding claim 103, Owa et al discloses at least two different optical elements comprise a [100] cubic crystalline optical element having a [100] crystal lattice direction substantial aligned with common optical axis (paragraph 0012).

Regarding claim 104, Owa et al discloses at least two different optical elements comprises a [110] cubic crystalline optical element having a [110] crystal lattice direction substantial aligned with common optical axis (paragraph 0015) .

Regarding claim 105, Owa et al discloses at least two different optical elements comprises a [110] cubic crystalline optical element having a [110] crystal lattice direction

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substantial aligned with common optical axis and a [100] cubic crystalline optical element having a [100] crystal lattice substantially aligned with common optical axis (paragraph 0015).

Regarding claim 106, Owa et al discloses at least two different optical elements comprises a [111] cubic crystalline optical element having a [111] crystal lattice direction substantial aligned with common optical axis (paragraph 0014) .

Regarding claim 107, Owa et al discloses, a numerical aperture is greater than .6 (paragraph 0009).

Regarding claim 108, Owa et al discloses an optical system having intrinsic birefringence that imparts retardance on light propagated through an optical system the optical system comprises a [110] cubic crystalline optical element having a [110] lattice direction aligned along an optical axis and a [100] cubic crystalline optical element having a [100] lattice direction along an optical axis , where two cubic crystalline optical elements have their respective crystal lattice selectively rotated with respect to each and about the optical axis to reduce retardance associated with an optical system (paragraph 0013 and 0015).

Regarding claim 109, Owa et al discloses, a numerical aperture is greater than .6 (paragraph 0009).

Allowable Subject Matter

4. Claims 89 – 91 and 93 – 101 are allowed.

5. The following is an examiner's statement of reasons for allowance: The prior art taken either singularly or in a combination fails to anticipate or fairly suggest the limitations of the independent claims, in such a manner that a rejection under 35 U.S.C. 102 or 103 would be proper. The prior art fails to teach a combination of all the claimed features as presented in independent claims 89 and 93, for example which include clocking the second cubic crystalline optical element with respect to first cubic crystalline optical element such that second set of lobes is selectively azimuthally rotated with respect to first of lobes and clocking the third cubic crystalline optical element with respect to the first cubic crystalline optical element such that third set of lobes is rotated about the optical axis with respect to the first set of lobes and third set of lobes and the second set of lobes being displaced by different amount an optical axis relative to the first set of lobes (claim 89); selected azimuthal rotation positioning the second set of lobes about an optical axis at location (a) azimuthal offset from the first set of locations of the first set of lobes and (b) azimuthally offset from midway between the first set of locations of the first set of lobes (claim 93).

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The closest prior art

Van der Veen et al (6,455,862 B1) discloses a lithographic projection apparatus.

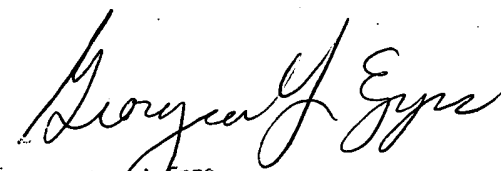
Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mohammed Hasan whose telephone number is (571) 272-2331. The examiner can normally be reached on M-TH, 7:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on (571) 272- 2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306..

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MH
May 25, 2004


Georgia Epps
Supervisory Patent Examiner
Technology Center 2800